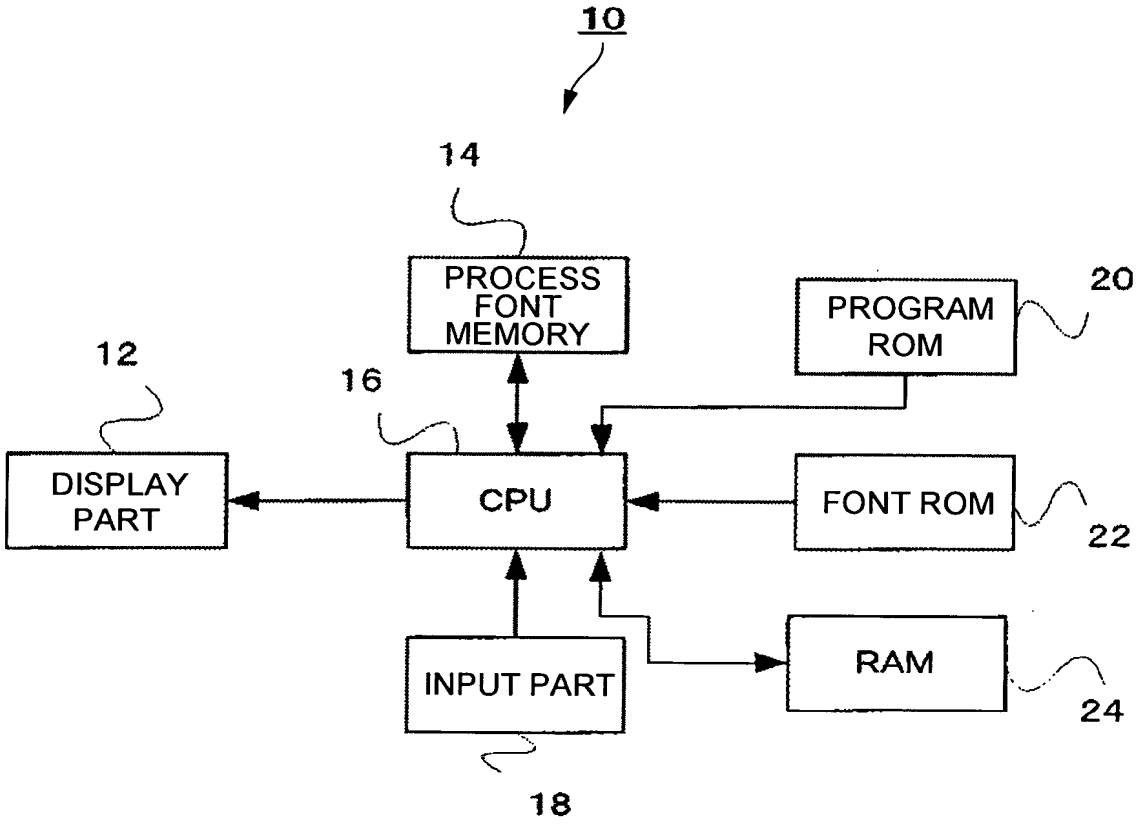

10
14
PROCESS FONT MEMORY
20
PROGRAM ROM
12
16
DISPLAY PART
CPU
FONT ROM
22
RAM
24
INPUT PART
18

FIG. 1

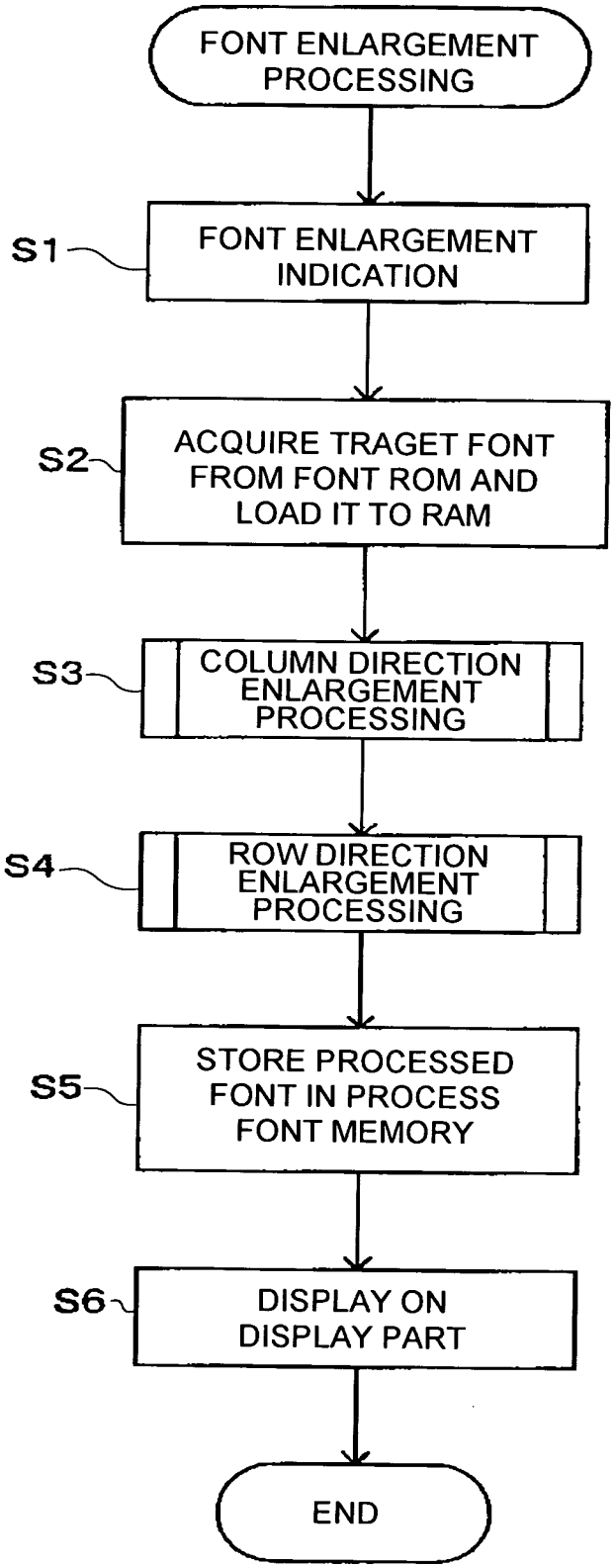

FONT ENLARGEMENT PROCESSING
S1
FONT ENLARGEMENT INDICATION
S2
ACQUIRE TRAGET FONT FROM FONT ROM AND LOAD IT TO RAM
S3
COLUMN DIRECTION ENLARGEMENT PROCESSING
S4
ROW DIRECTION ENLARGEMENT PROCESSING
S5
STORE PROCESSED FONT IN PROCESS FONT MEMORY
S6
DISPLAY ON DISPLAY PART
END

FIG. 2

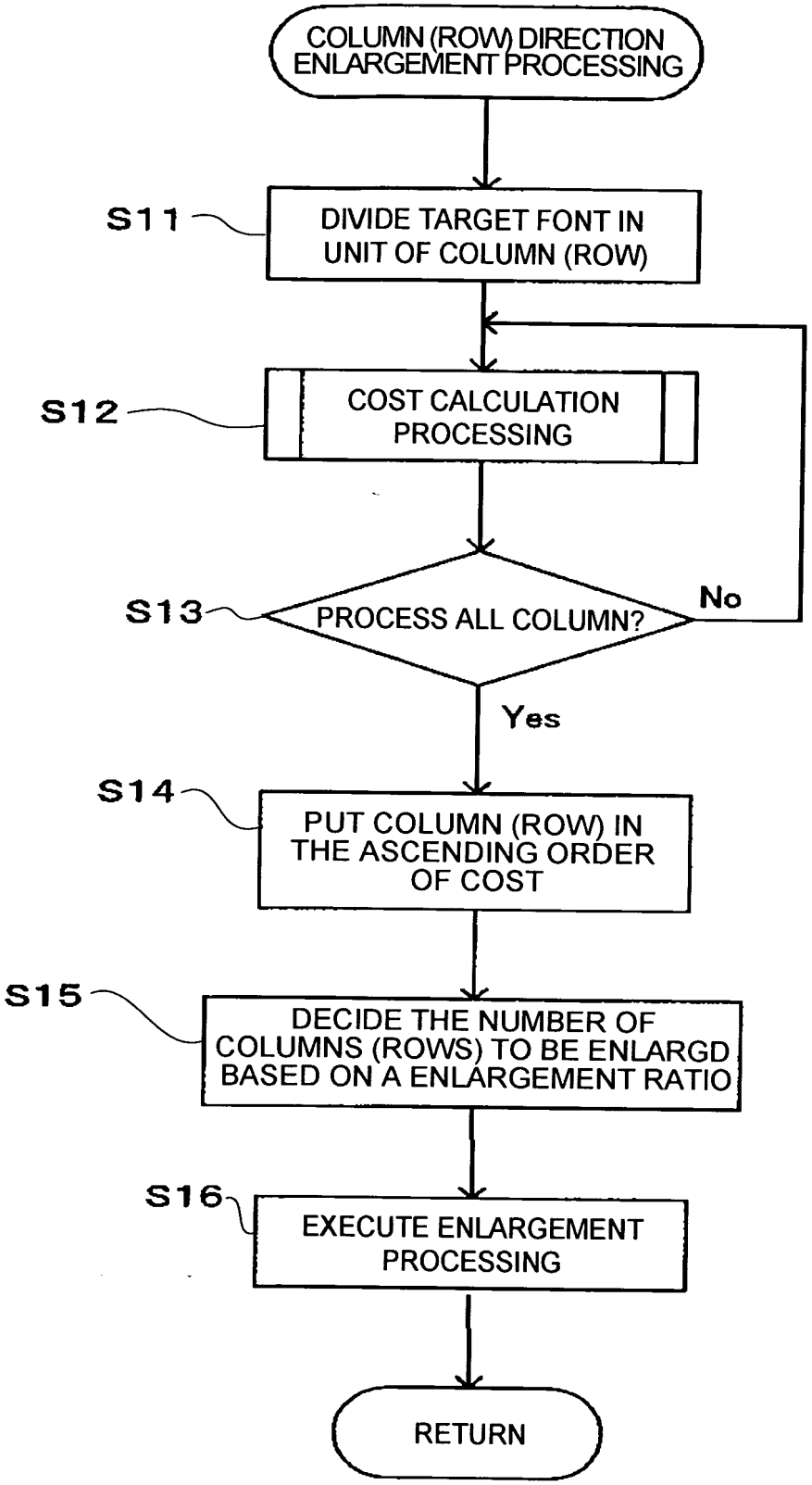

COLUMN (ROW) DIRECTION ENLARGEMENT PROCESSING
S11
DIVIDE TARGET FONT IN UNIT OF COLUMN (ROW)
S12
COST CALCULATION PROCESSING
S13
PROCESS ALL COLUMN?
No
Yes
S14
PUT COLUMN (ROW) IN THE ASCENDING ORDER OF COST
S15
DECIDE THE NUMBER OF COLUMNS (ROWS) TO BE ENLARGD BASED ON A ENLARGEMENT RATIO
S16
EXECUTE ENLARGEMENT PROCESSING
RETURN

FIG. 3

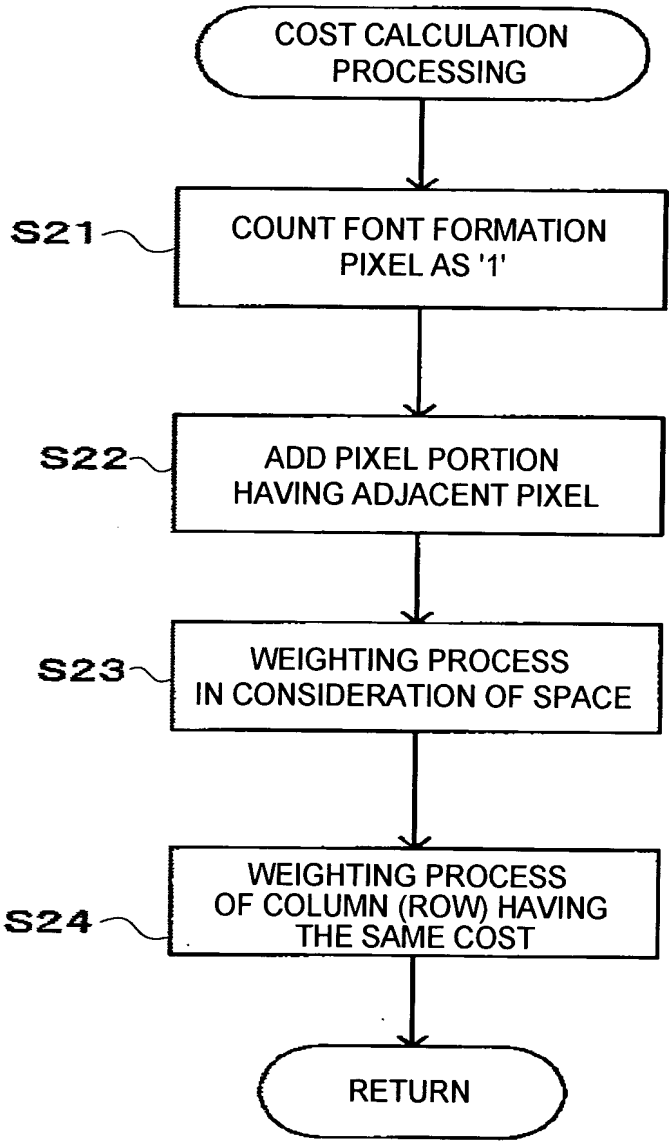
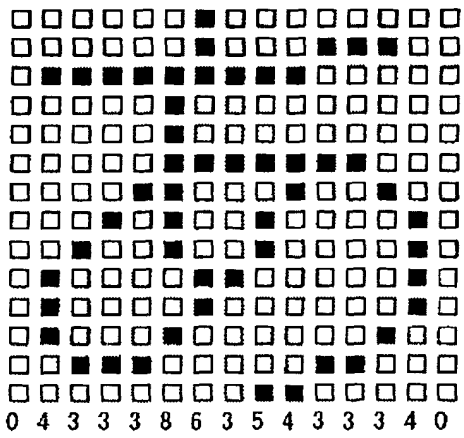

COST CALCULATION PROCESSING
S21
COUNT FONT FORMATION PIXEL AS '1'
S22
ADD PIXEL PORTION HAVING ADJACENT PIXEL
S23
WEIGHTING PROCESS IN CONSIDERATION OF SPACE
S24
WEIGHTING PROCESS OF COLUMN (ROW) HAVING THE SAME COST
RETURN

FIG. 4

S21 : COUNT FONT FORMATION PIXEL (■)

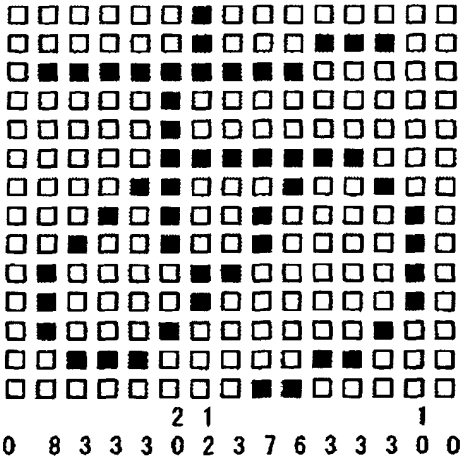


IN LEFT EXAMPLE, COUNT ■ ↓ DIRECTION

← COST OF EACH COLUMN (POSITION OF -)

FIG. 5A

S22 : ADD ADJACENT PIXEL PORTION
(ADD +2 TO CONTINUOUS ■)



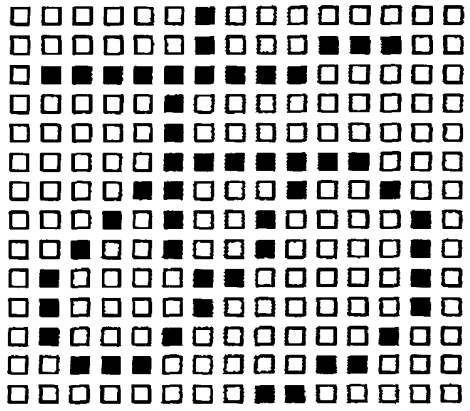
□■■□□ = TO BE 2 + 2 = 4
■□■□■ = COST IS HIGHER THAN 3

□■■■■ = TO BE 4 + 2 + 2 + 2 = 10
■■□■■ = COST IS HIGHER THAN
(2 + 2) + (2 + 2) = 8

←COST OF EACH COLUMN (POSITION OF +)
←COST OF EACH COLUMN (POSITION OF -)

FIG. 5B

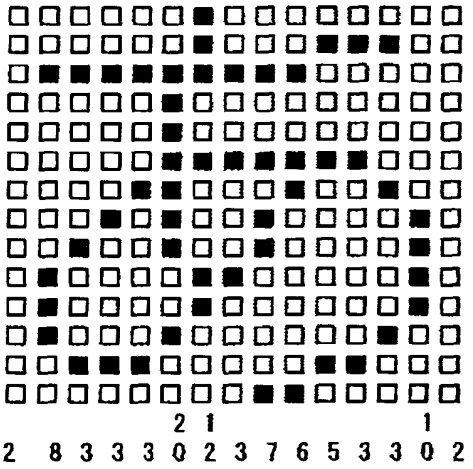
S 2 3 : WEIGHTING PROCESS IN CONSIDERATION OF SPACE
IF BOTH ENDS AND 1 PIXEL INNER PORTION ARE SPACE (■ IS 0),
ADD +2, +1, RESPECTIVELY



COST OF EACH COLUMN (POSITION OF +)
COST OF EACH COLUMN (POSITION OF -)

FIG. 6A

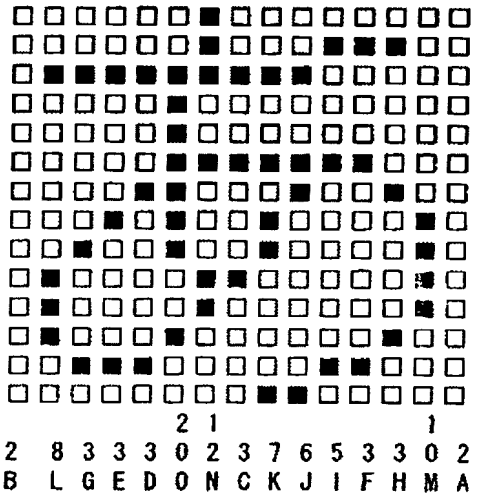
S 2 4 : WEIGHTING PROCESS OF COLUMN (ROW) HAVING THE SAME COST
IF THE PATTERN IS EQUAL TO RIGHT ROW, ADD +2



WEIGHTING PROCESS FOR PREVENTING THE POSITION TO BE ENLARGED FROM SLANTING

FIG. 6B

S14: PUT ORDER FROM CENTER OF CHARACTER TO EDGE IN THE ASCENDING ORDER OF COST

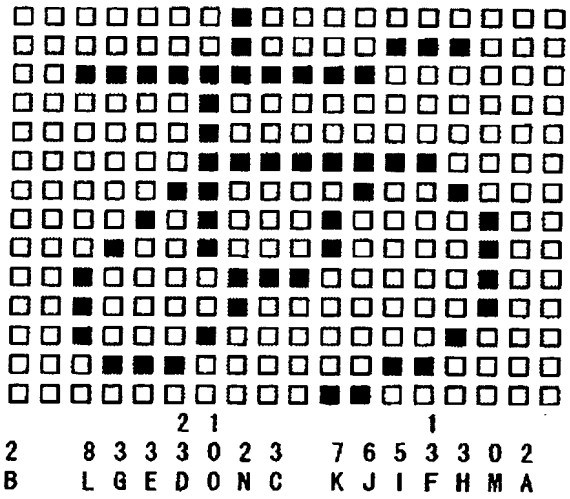


DISTRIBUTE FOR PREVENTING THE DIRECTION OF ENLARGEMENT FROM SLANTING

COST OF EACH COLUMN (POSITION OF +)
COST OF EACH COLUMN (POSITION OF -)
ASCENDING ORDER OF COST (A, B, · · · ·)

FIG. 7A

S16: ENLARGEMENT PROCESSING



IN LEFT EXAMPLE, 3 DOT WIDTHWISE ENLARGEMENT IS EXECUTED (15 → 18)

COST OF EACH COLUMN (POSITION OF +)
COST OF EACH COLUMN (POSITION OF -)
ASCENDING ORDER OF COST (A, B, · · · ·)

FIG. 7B

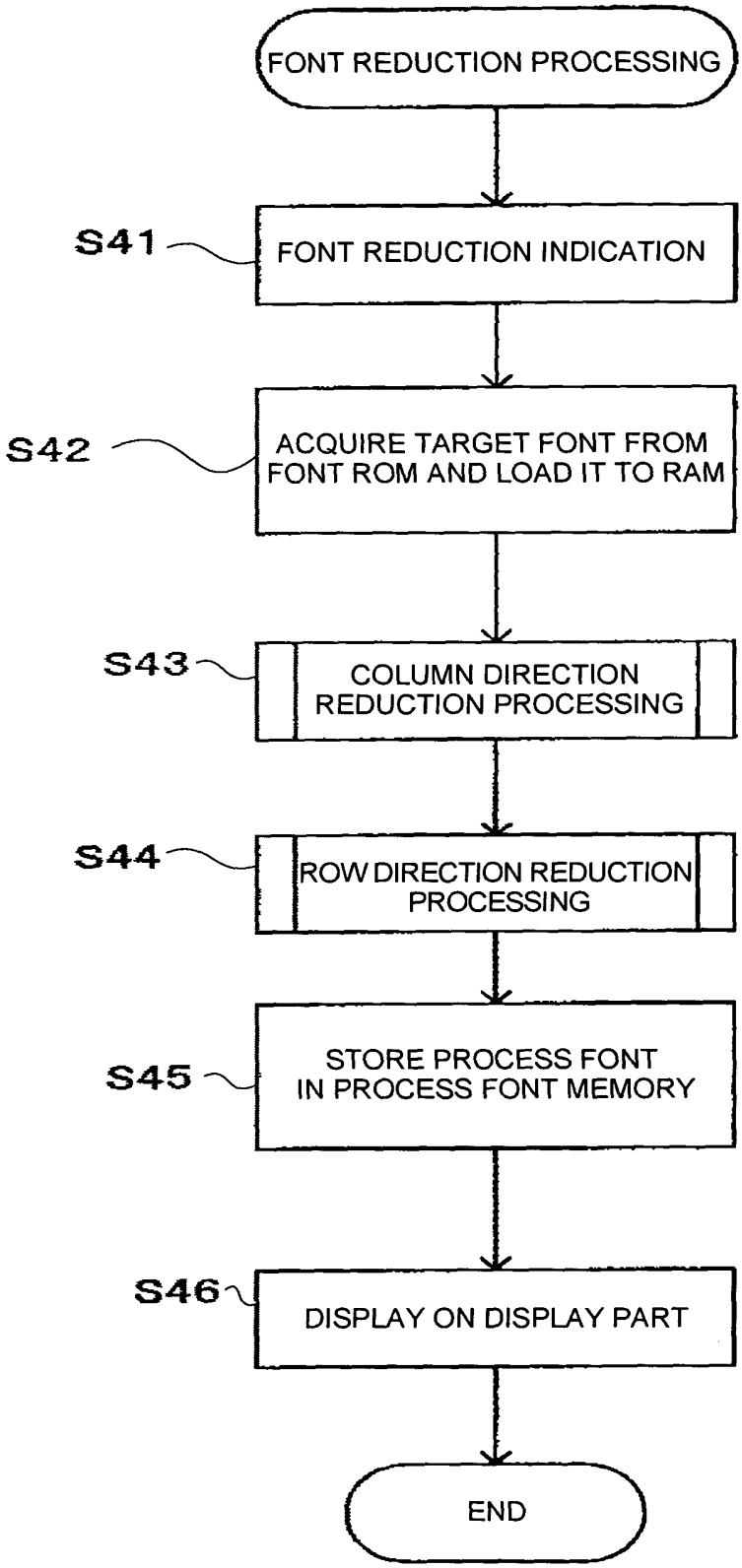

FONT REDUCTION PROCESSING
S41
FONT REDUCTION INDICATION
S42
ACQUIRE TARGET FONT FROM FONT ROM AND LOAD IT TO RAM
S43
COLUMN DIRECTION REDUCTION PROCESSING
S44
ROW DIRECTION REDUCTION PROCESSING
S45
STORE PROCESS FONT IN PROCESS FONT MEMORY
S46
DISPLAY ON DISPLAY PART
END

FIG. 8

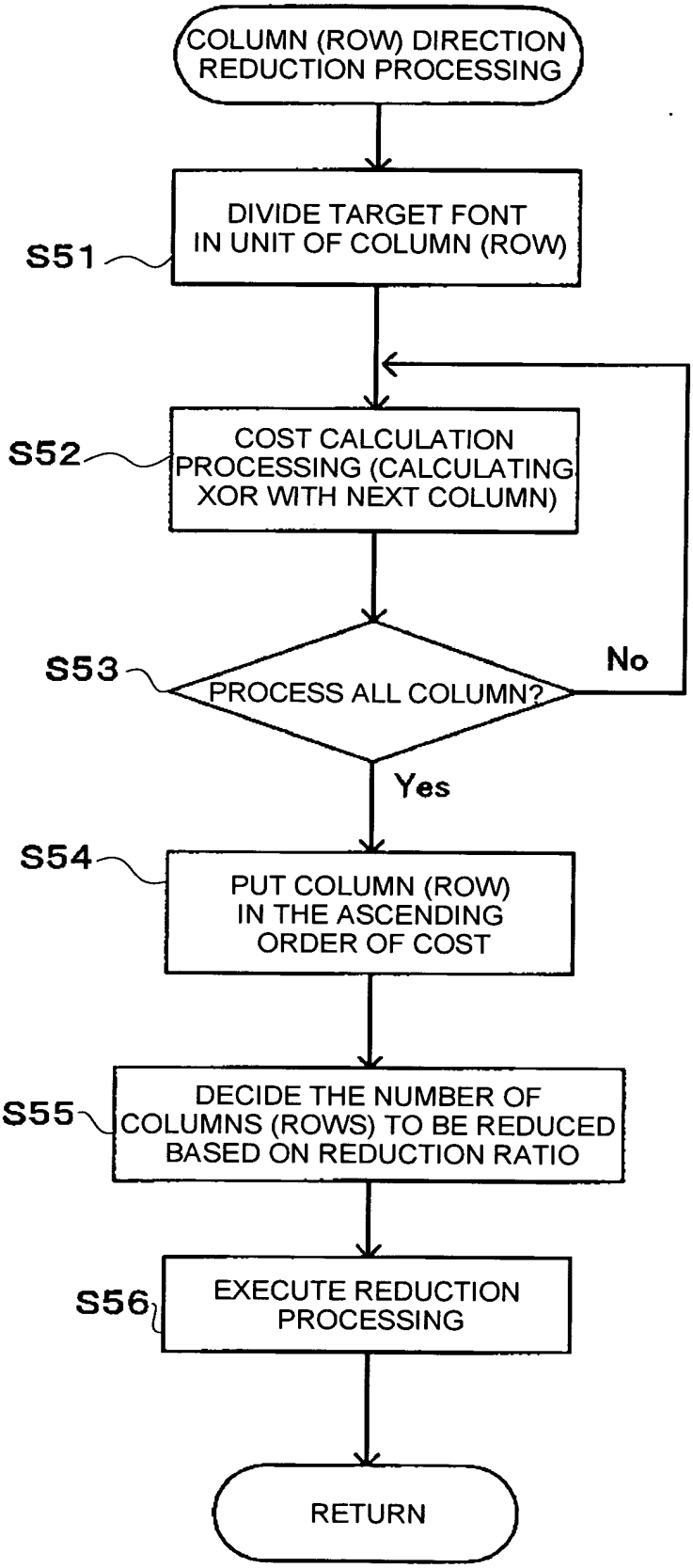
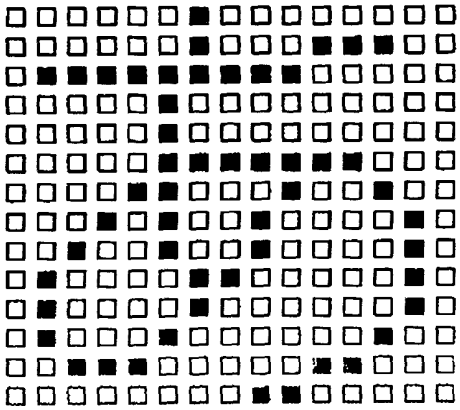

COLUMN (ROW) DIRECTION REDUCTION PROCESSING
DIVIDE TARGET FONT IN UNIT OF COLUMN (ROW)
S51
COST CALCULATION PROCESSING (CALCULATING XOR WITH NEXT COLUMN)
S52
PROCESS ALL COLUMN?
S53
No
Yes
PUT COLUMN (ROW) IN THE ASCENDING ORDER OF COST
S54
DECIDE THE NUMBER OF COLUMNS (ROWS) TO BE REDUCED BASED ON REDUCTION RATIO
S55
EXECUTE REDUCTION PROCESSING
S56
RETURN

FIG. 9

S52: CALCULATING XOR WITH ADJACENT ROW, COUNT THE NUMBER WHEN XOR IS 1

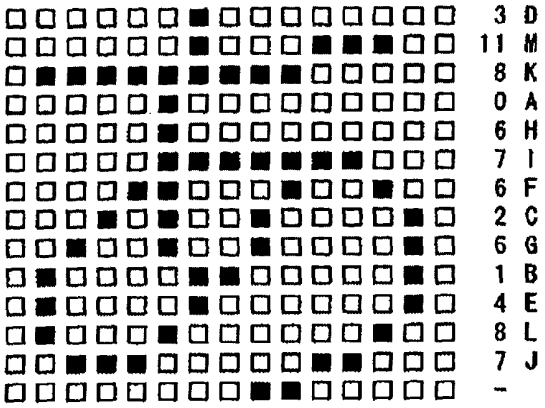


IN LEFT EXAMPLE, CALCULATING XOR WITH LOWER COLUMN, AND COUNT 1 IN A DIRECTION

BUT, COUNT IS EXCEPTED FOR LAST COLUMN

FIG. 10A

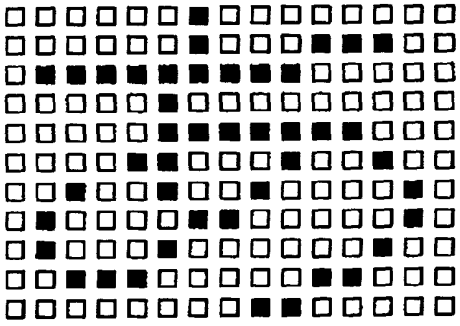
S54: PUT FROM CENTER OF CHARACTER TO EDGE IN THE ASCENDING ORDER OF COST



DISTRIBUTE FOR PREVENTING THE DIRECTION OF REDUCTION FROM SLANTING

FIG. 10B

S56: REDUCTION PROCESSING



IN LEFT EXAMPLE, 3 DOT LENGTHWISE REDUCTION IS DONE (14 → 11)

FIG. 10C

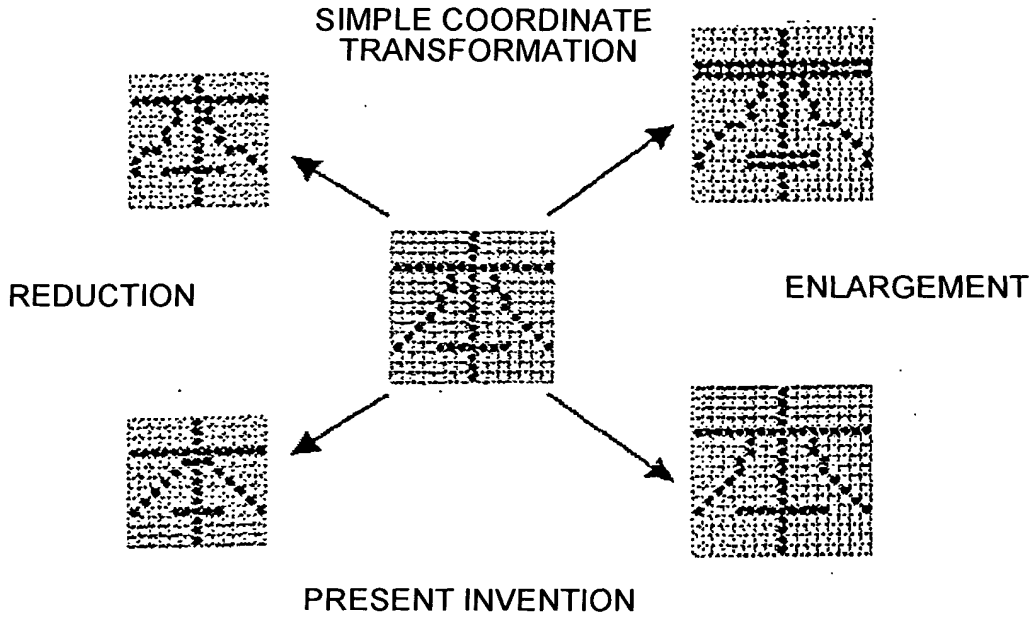


FIG. 11A

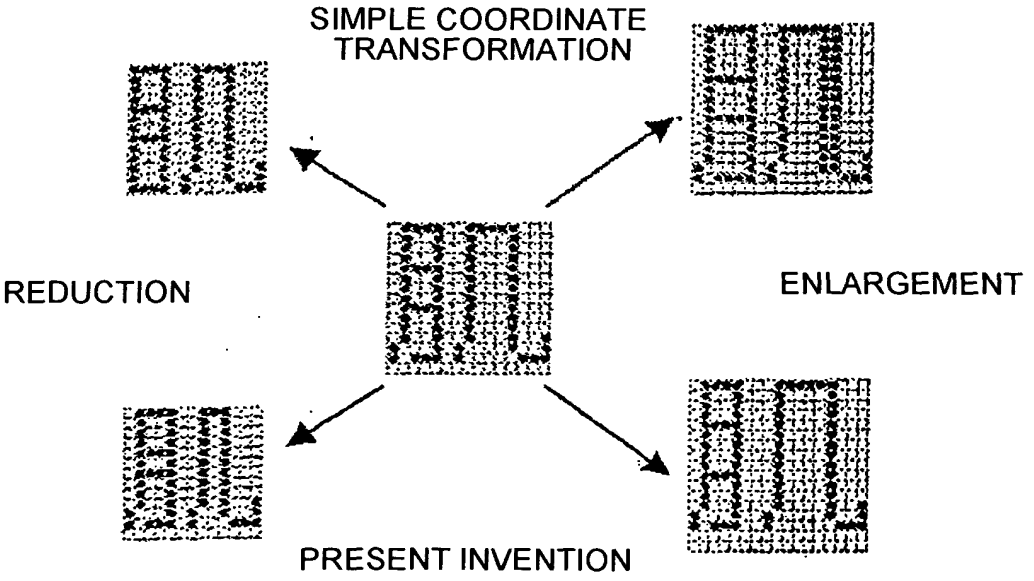


FIG. 11B

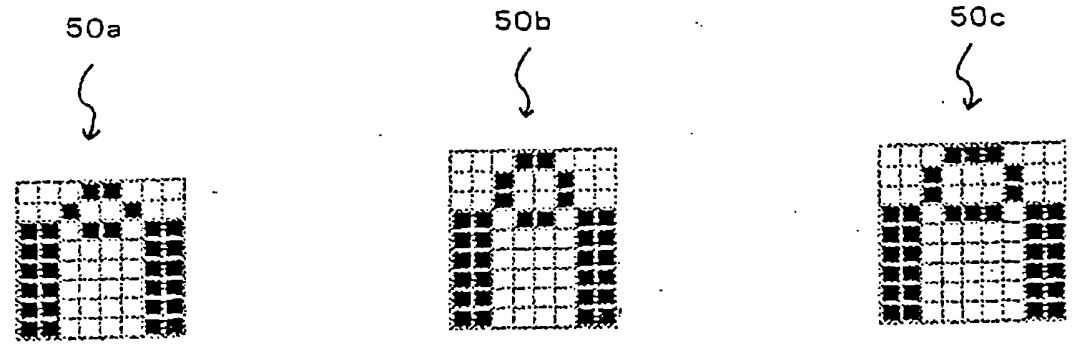


FIG. 12A

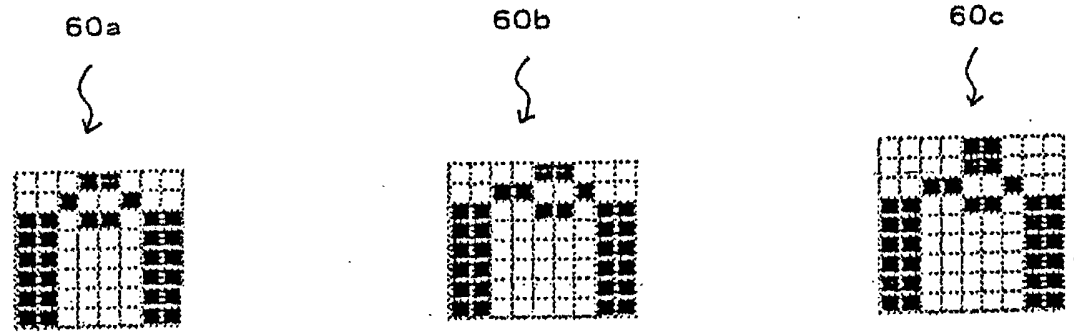


FIG. 12B

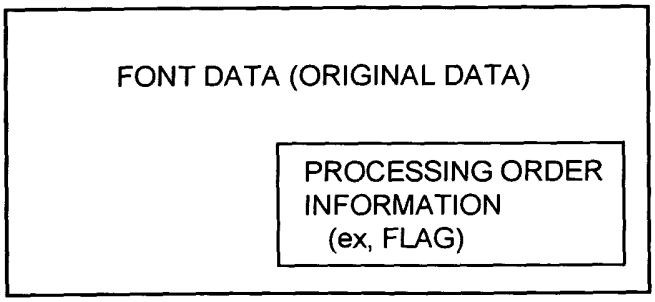


FIG. 12C

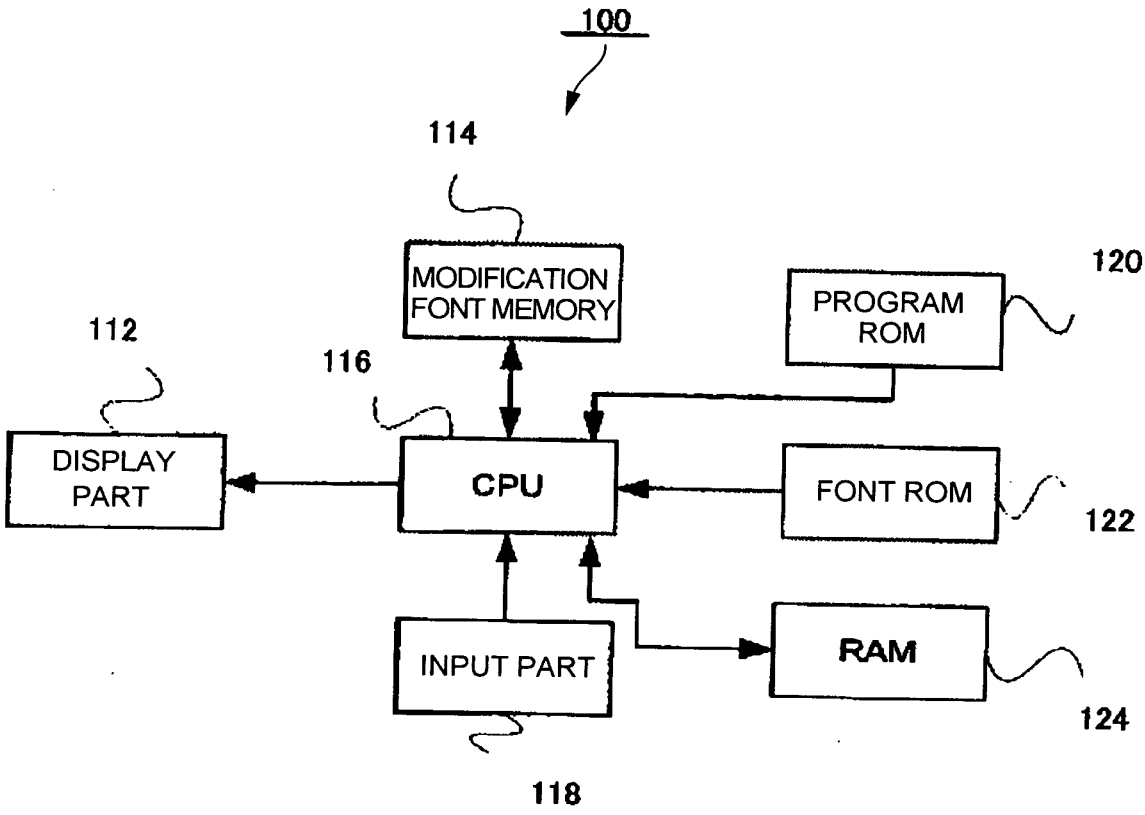

100
114
MODIFICATION FONT MEMORY
120
PROGRAM ROM
112
116
DISPLAY PART
CPU
FONT ROM
122
INPUT PART
RAM
124
118

FIG. 13

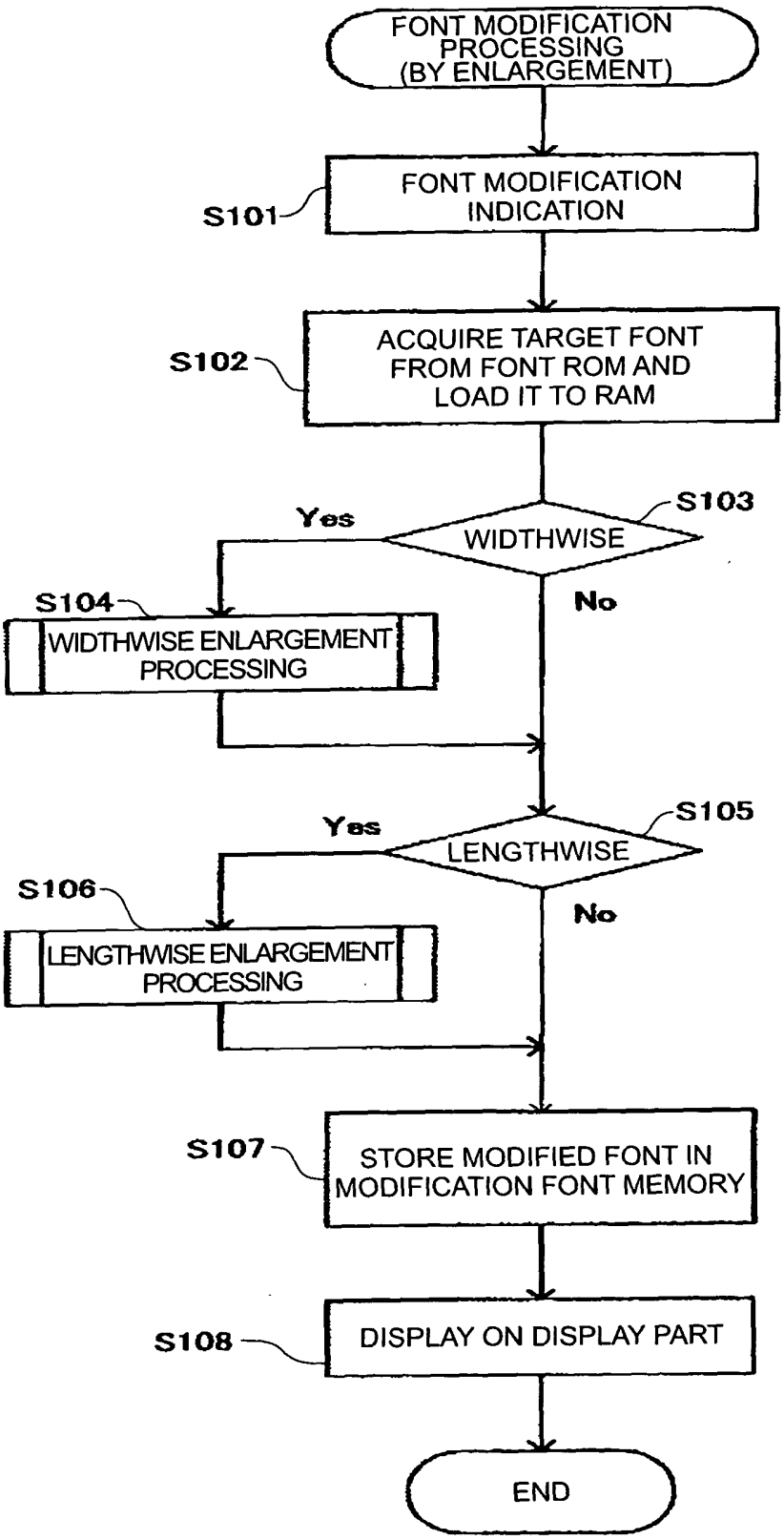

FONT MODIFICATION PROCESSING (BY ENLARGEMENT)
S101
FONT MODIFICATION INDICATION
S102
ACQUIRE TARGET FONT FROM FONT ROM AND LOAD IT TO RAM
S103
WIDTHWISE
Yes
No
S104
WIDTHWISE ENLARGEMENT PROCESSING
S105
LENGTHWISE
Yes
No
S106
LENGTHWISE ENLARGEMENT PROCESSING
S107
STORE MODIFIED FONT IN MODIFICATION FONT MEMORY
S108
DISPLAY ON DISPLAY PART
END

FIG. 14

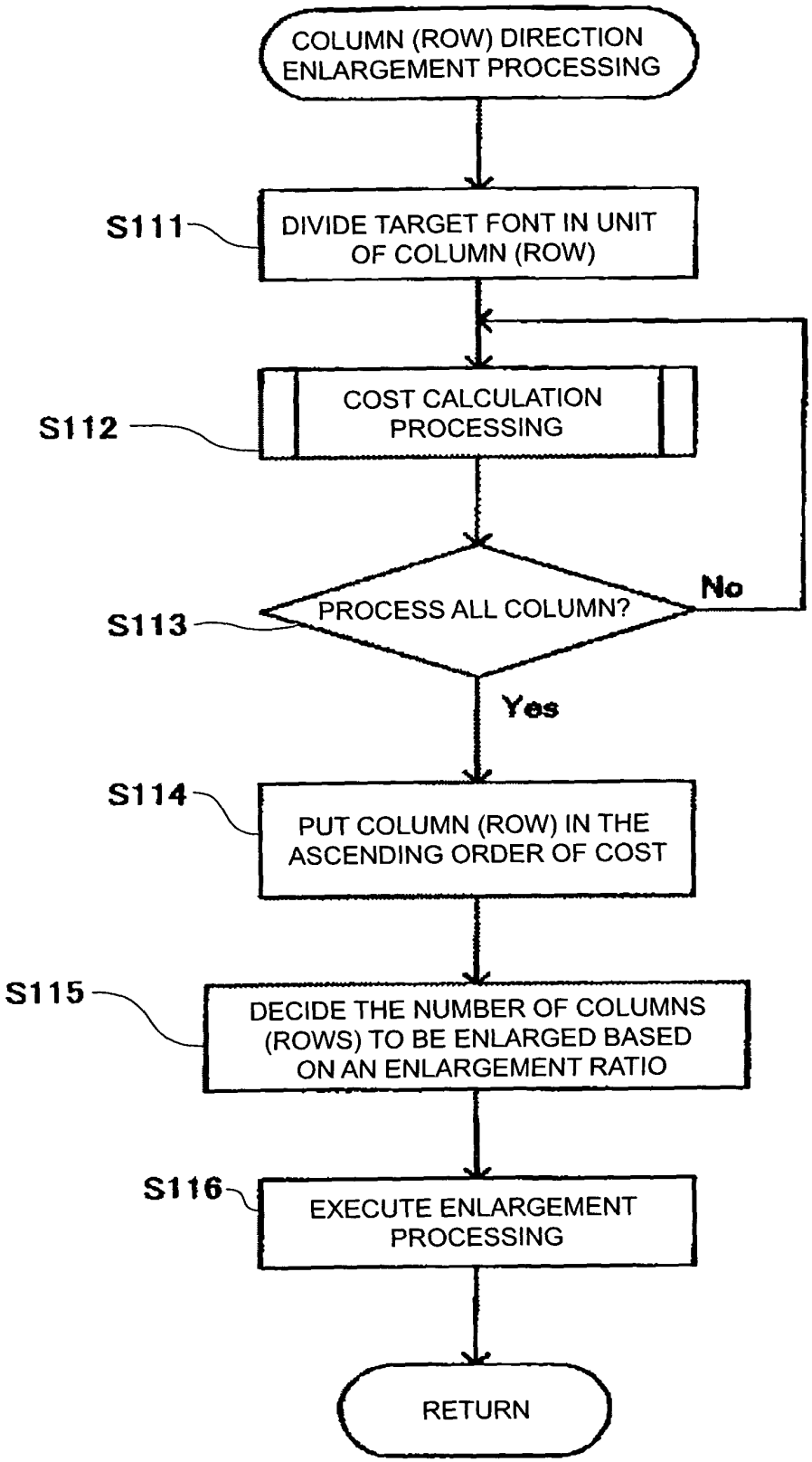

COLUMN (ROW) DIRECTION ENLARGEMENT PROCESSING
S111
DIVIDE TARGET FONT IN UNIT OF COLUMN (ROW)
S112
COST CALCULATION PROCESSING
S113
PROCESS ALL COLUMN?
No
Yes
S114
PUT COLUMN (ROW) IN THE ASCENDING ORDER OF COST
S115
DECIDE THE NUMBER OF COLUMNS (ROWS) TO BE ENLARGED BASED ON AN ENLARGEMENT RATIO
S116
EXECUTE ENLARGEMENT PROCESSING
RETURN

FIG. 15

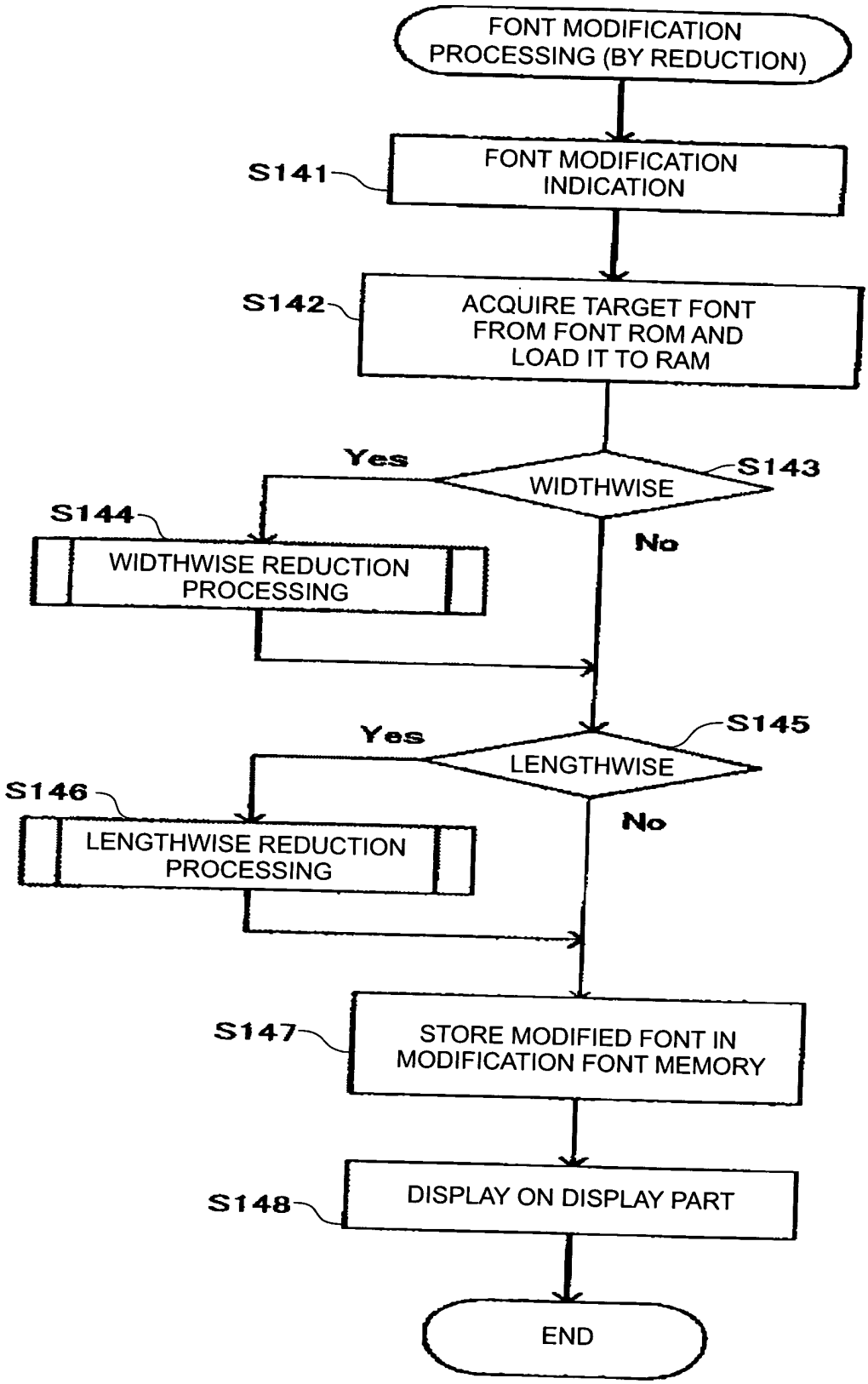

FONT MODIFICATION PROCESSING (BY REDUCTION)
S141
FONT MODIFICATION INDICATION
S142
ACQUIRE TARGET FONT FROM FONT ROM AND LOAD IT TO RAM
Yes
S143
WIDTHWISE
No
S144
WIDTHWISE REDUCTION PROCESSING
Yes
S145
LENGTHWISE
No
S146
LENGTHWISE REDUCTION PROCESSING
S147
STORE MODIFIED FONT IN MODIFICATION FONT MEMORY
S148
DISPLAY ON DISPLAY PART
END

FIG. 16

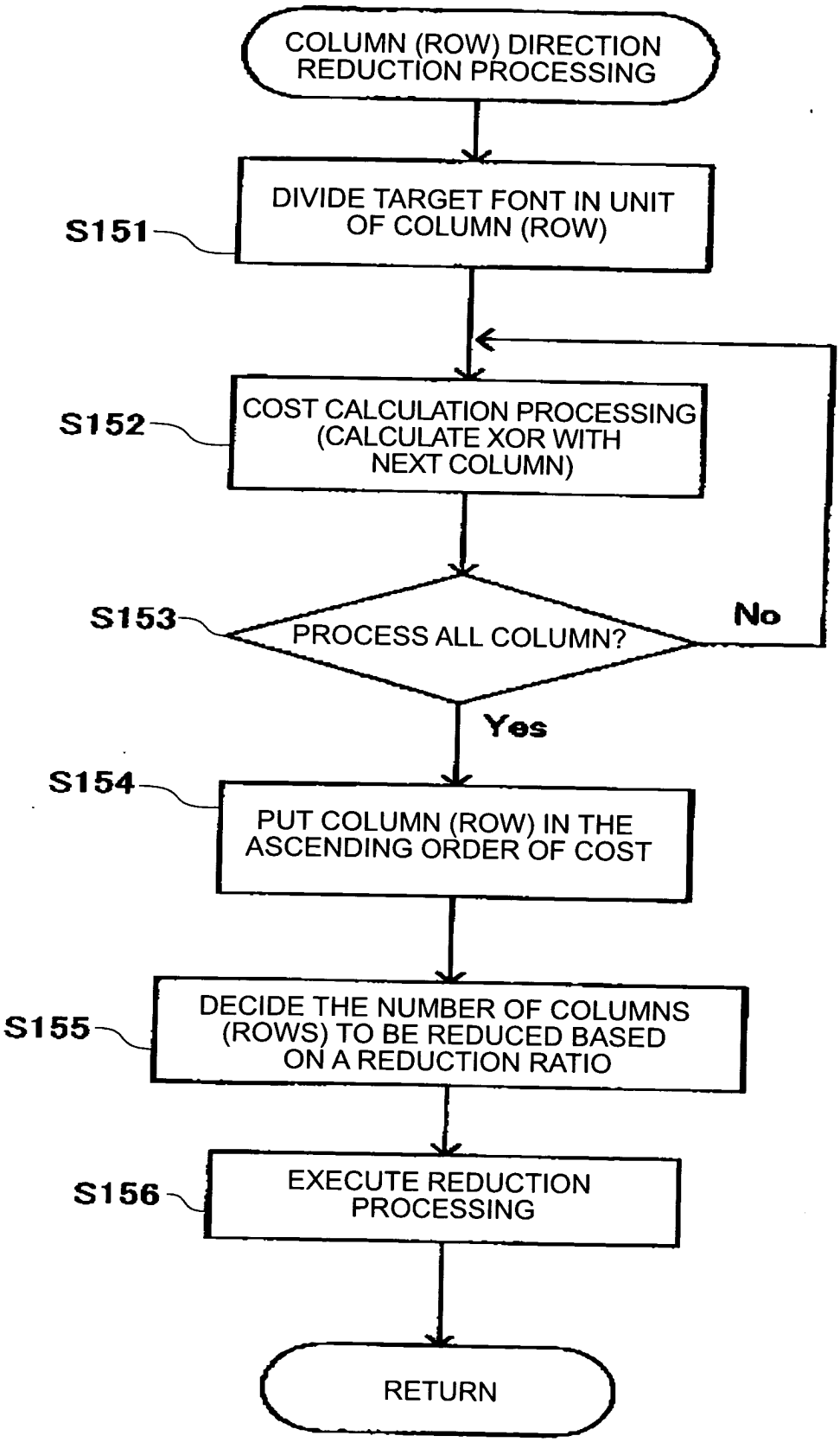

COLUMN (ROW) DIRECTION REDUCTION PROCESSING
S151
DIVIDE TARGET FONT IN UNIT OF COLUMN (ROW)
S152
COST CALCULATION PROCESSING (CALCULATE XOR WITH NEXT COLUMN)
S153
PROCESS ALL COLUMN?
No
Yes
S154
PUT COLUMN (ROW) IN THE ASCENDING ORDER OF COST
S155
DECIDE THE NUMBER OF COLUMNS (ROWS) TO BE REDUCED BASED ON A REDUCTION RATIO
S156
EXECUTE REDUCTION PROCESSING
RETURN

FIG. 17